US ARMY ENGINEER DISTRICT, SACRAMENTO SPK-03430
CORPS OF ENGINEERS Sep 85
SACRAMENTO, CALIFORNIA Revised Apr 89

TO: Architect-Engineers and District Personnel:

1. The attached revised guide specification supercedes the previous guide, PRECAST TILT-UP CONCRETE, SPK-3B, dated September 1985, and is for use in the preparation of project specifications.

TEXT REVISIONS
Para 1
Para 1.2

NOTE: A-E's should read all the TECHNICAL NOTES located at the beginning of this guide specification and edit the specification accordingly.

SPK-03430
Apr 1989

GENERAL NOTES

1. This guide specification is to be used in the preparation of contract specifications in accordance with the Sacramento District Specification Manual. It will not be made a part of a contract merely by reference; pertinent portions will be copied verbatim into the contract documents.

2. Where numbers, symbols, words, phrases, clauses, or sentences in this specification are enclosed in the following manner: [ ], a choice or modification must be made; delete inapplicable portion(s) carefully. Where blank spaces occur in sentences, insert the appropriate data. Where entire paragraphs are not applicable, they should be deleted completely.

TECHNICAL NOTES

A. The section number should be inserted in the specification heading and prefixed to each page number in the specification section.

B. Paragraph 1: The listed designations for publications are those that were in effect when this guide specification was being prepared. These designations are updated when necessary by District Instruction, and references in project specifications need be no later than in the current District Instruction for this guide specification. To minimize the possibility of error, letter suffixes, amendments, and dates indicating specific issues should be retained in paragraph 1 and omitted elsewhere in the project specification.

C. Paragraph 4.6: Use only when exposed aggregate finish is used.

D. Paragraph 4.7: Use only when rustication strips are required.

E. Add additional materials required to complete the project to end of Article A and number accordingly.

F. Paragraphs 6.5 and 6.5.2: Finishes indicated are suggestions only. Modify as required to suit project. Other approved finishes may be inserted in lieu of 6.5.2. Delete inapplicable finishes.

G. Paragraph 2.5: Paragraph revised to delete contractor option to cast

"small" sample panels which are not representative of full size panels. The revisions reflect recommendations made in Technical report SL-84-9, "How to Avoid Deficiencies in Architectural Concrete Construction", published by Dept. of the Army, Waterways Experiment Station.

SPK-03430
Apr 1989

INDEX

SECTION 03430

PRECAST TILT-UP CONCRETE
(JOB SITE CAST)

SECTION 03430

PRECAST TILT-UP CONCRETE
(JOB SITE CAST)

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 American Concrete Institute (ACI):

ACI 318-83 Building Code Requirements for Reinforced Concrete.

1.2 American Society for Testing and Materials (ASTM):

A 36-84a Structural Steel.

A 185-85 Welded Steel Wire Fabric for Concrete Reinforcement.

A 615-86 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

A 616-86 Rail-Steel Deformed and Plain Bars for Concrete Reinforcement.

A 617-84 Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.

C 171-69 (R 1986) Sheet Materials for Curing Concrete.

1.3 American Welding Society (AWS) Publication:

D 1.4-79 Structural Welding Code - Reinforcing Steel.

2. GENERAL: Except as specified hereinafter, precast concrete elements shall conform with the applicable requirements noted in SECTION: CONCRETE FOR BUILDING CONSTRUCTION.

2.1 Fabrication and installation of all precast work to be by a fabricator and erector that has had previous experience in work comparable to that required for this project and can show samples of completed installations to

that effect, that are satisfactory to the Contracting Officer.

2.2 Responsibility: The Contractor shall be responsible for sizing and locating the lifting inserts and extra reinforcing required for lifting and handling of each precast concrete element. Calculations showing the size and location of each insert, size and location of extra reinforcing, and methods

of calculation to be submitted to the Contracting Officer for review. The Contracting Officer's review of the calculations, pick-up inserts and reinforcing shall not relieve the Contractor of responsibility for their adequacy or appropriateness.

2.3 Workmanship: All precast elements to be formed to the shapes, dimensions and sizes indicated and to provide the surface textures and finishes specified. Surfaces to be true, uniform in appearance and free from defects and form marks. No substitution of sources of water, cement or aggregate will be permitted after acceptance of sample panels.

2.4 Handling: All precast concrete elements shall be carefully handled and supported during curing, storage, hauling, handling, and erection, in such a way as to prevent warpage, cracking, straining, discoloration, or other injury. Handle in nearly vertical position at all times, set on padded easels, and use padded spacers using non-staining material for padding. Do not lay work in contact with earth or other materials that may stain the surface. Finished work should not be walked upon nor handled with greasy rags, ropes, or hands, nor covered with sacks or other type of covering that, when wet, may cause staining. Chipped, cracked, spalled, warped, or otherwise defective precast concrete elements, in the opinion of the Contracting Officer, shall be rejected and replaced at no increase in cost to the Government.

2.5 Samples: Before production run of elements, cast and lift 1 full-size sample panel for the Contracting Officer's review at the casting site. Sample panel to be typical panel, as designated by the Contracting Officer. Sample to be used to judge all representative details, quality of forming and concrete finish. Should sample panel be accepted, it may subsequently be incorporated into the work. If sample panel is not accepted, additional samples to be submitted until a fully acceptable panel is produced. All unaccepted samples are the Contractor's property and shall be disposed of at no increase in cost to the Government. The procedures used to cast the sample panel must be recorded in a report showing the step-by-step method used to produce the sample panel. It will be available to the Contracting Officer upon request. This casting method will then be duplicated when casting the remaining panels. In addition to the above required sample, the first unit cast from each different form shall be inspected and fully accepted by the Contracting Officer prior to proceeding with casting other like units.

2.5.1 In addition to the above required sample, the first unit cast from each different form shall be inspected and fully accepted by the Contracting Officer prior to proceeding with casting other like units.

3. SHOP DRAWINGS: Submit in accordance with the requirements of the SPECIAL

CLAUSES showing details; dimensions; connections; type, capacity and location of pick-up points; location and anchorage of all embedded items; location of openings; extra reinforcing required for lifting; structural calculations accounting for all the aforementioned items; and other pertinent data as required by the Contracting Officer. Each precast element when delivered to have setting number clearly marked on an unexposed surface corresponding to its location as indicated on the Shop Drawings.

4. MATERIALS:

4.1 Concrete shall be Class [AA] [A], using 1-inch maximum aggregate as specified in SECTION: CONCRETE FOR BUILDING CONSTRUCTION.

4.2 Reinforcing:

4.2.1 Bars: Deformed, conforming to one of the following:

4.2.1.1 ASTM Designation A 615, Grade [40] [60] [75].

4.2.1.2 ASTM Designation A 616, Grade [50] [60].

4.2.1.3 ASTM Designation A 617, Grade [40] [60].

4.2.2 Mesh reinforcement shall conform to ASTM Designation A 185 of the mesh and wire sizes indicated.

4.3 Weld plates and miscellaneous fabricated items required for erection and connection purposes shall be formed of steel conforming to ASTM Designation A 36.

4.4 Lifting inserts shall be of the type recommended by the manufacturer for the load and condition of use.

4.5 Bond Breaker: A commercial product shall be used that is nonstaining and will permit painting of concrete without etching or prior surface treatment to assure bond.

4.6 Aggregate for exposure shall pass a [3-inch] screen and be retained on a [2-inch] screen. Aggregate shall be [river run] [crushed] from (indicate source) and the color shall be (indicate color or color range). [Aggregates shall be 100 percent free from all stain-producing iron and other stain-producing compounds as indicated by certified analysis furnished by the supplier.]

4.7 Rustication strips shall be of the size and shape indicated and shall have kerfed backs to facilitate removal.

5. FORMS:

5.1 Construct forms of approved non-absorptive materials that will produce precast concrete elements having sharp corners and arrisers and dimensional accuracy within the tolerances noted. Forms to be braced and reinforced

sufficiently to withstand all stress occassioned by casting and high frequency vibration without distortion.

5.2 Thoroughly clean form faces after each casting operation and make all required repairs. An approved non-staining form-release agent or bond breaker may be used to aid stripping or lifting.

5.3 Place all embedded items in forms, prior to casting, within tolerances noted.

6. FABRICATION:

6.1 Mixing Concrete: Concrete to have the workability necessary for ready placement and consolidation in forms without segregation, honeycomb or rock-pockets.

6.2 Fabricate precast units to sizes and shapes indicated. In the finished work, no unfinished edges shall be exposed to view. The finished units shall be straight, and true to size and shape, within the tolerances specified. Exposed edges shall be sharp, straight, and square and all flat surfaces in a true plane. Warped, cracked, broken, spalled, stained or otherwise defective units shall not be used. Units with imperfections in exposed surface such as joint lines, uneven color or uneven texture will not be acceptable.

6.3 Reinforcing shall be of sizes and spacings indicated on the Contract Documents. All steel reinforcement shall be kept a minimum of 1-1/2 inches from the edges and surfaces of precast units. Do not coat reinforcing steel with bond breaker.

6.4 Place and secure in the forms all anchors, clips, inserts, lifting devices, bolts, ties and other devices required for handling and installing the precast units and for the attachment of subsequent items as indicated or specified.

6.5 Finish:

6.5.1 Open side of form shall receive a broom finish. In place, this surface shall be the [outside] [inside] surface of the wall.

6.5.2 Face shall be cast on a smooth level and crack free casting bed and shall have an "as cast" finish.

[6.5.2 Exposed Aggregate Surface: Spread a layer of fine sand over bottom of form to depth of about 1/3 the diameter of the aggregate. Push aggregate into sand to obtain the densest possible coverage. After all aggregate is placed, spray with fine spray to settle sand so that each piece is held securely and 1/3 to 1/2 of each piece of aggregate is embedded. After lifting wash excess sand from surface.]

[6.5.2 Dimpled Surface: Spread a single layer of 2-inch gravel or crushed rock over the form bottom, leaving a small space between the individual

pieces. Spread a single layer of 4 mil polyethylene film conforming to PS 17-69 over the gravel bed and securely attach to edge of forms.]

6.6 Curing:

6.6.1 Concrete shall be kept moist during the curing period. Precast elements made with Type I or II Portland cement shall be maintained above 70/F. for at least 3 days. Elements made with Type III Portland cement shall be maintained above 70/ F. for at least 2 days. For each increment of 5/ below 70/ F. in the average curing temperature, these periods shall be increased by 1/2 day for elements made of Type I or II Portland cement and by 1/4 day for units made of Type III Portland Cement. The average curing temperature shall in no case be less than 50/ F.

6.6.2 When high-pressure steam, steam vapor, vacuum, or other accepted processes are used to accelerate hardening, they shall produce strength and durability properties at least equivalent to those obtained by the methods indicated above.

6.7 Sampling and Testing: Testing of end items is the responsibility of the Contractor, except as otherwise noted in SECTION: CONSTRUCTION QUALITY CONTROL.

6.7.1 Reinforcement: Mill certificates of tests on steel reinforcing bars shall be submitted.

6.7.2 Concrete Cylinders: Test cylinders shall be in accordance with the Construction Control Manual, except as hereinafter specified. A minimum of 3 test cylinders for each 50 cubic yards or fraction thereof of each class of concrete for each day's pour shall be obtained during casting of the precast units. Cylinders shall be tested at 3, 7, and 28 days.

7. ERECTION:

7.1 Methods and Sequence:

7.1.1 Concrete elements shall remain in their casting position until attaining a minimum compressive strength of 0.70 fc of the specified 28-day compressive strength.

7.1.2 Precast units shall be handled, transported and stored in a manner to prevent warpage, cracking, straining, or other damage.

7.1.3 During erection, temporary loads in excess of the design load may be permitted, providing the resultant stresses do not exceed:

a. The tensile stresses in the concrete during handling, computed on

the basis of an uncracked section, shall be less than 75% of the modulus of rupture of the plain concrete at that time.

b. The allowable design stresses in the steel shall conform to the same requirements as those of ACI 318, except that under temporary loading conditions during erection the unit tensile stress may be increased to 80% of the minimum yield strength.

7.2 Installation and Setting of Precast Concrete:

7.2.1 General Requirements: The installation and setting shall be performed by workmen skilled in this type of work. Installation shall be in accordance with shop drawings. Each unit, piece, or panel, shall be set in position assigned on the shop drawings, carefully plumbed and aligned and securely anchored to the structural backing as detailed.

7.2.2 Setting Precast Units: Precast concrete units shall be secured to structure by welding and/or bolting as indicated. Set units plumb, level and true with joints kept open and units resting on temporary shims while welded or bolted connections are made. Remove shims as soon as possible to avoid staining. Joints shall be uniform and of width indicated. All welding shall be done by qualified operators as certified by the American Welding Society. All welded joints and exposed or accessible steel clips, bolts and other connecting devices shall be given a coat of zinc chromate or other approved paint after erection.

7.2.3 Connection Devices:

7.2.3.1 Welding of reinforcing steel, metal inserts, and connections shall be in accordance with AWS D1.4. Care should be taken during welding of inserts and splices to minimize the effect of welding heat. Acceptability of any resulting cracking shall be as directed by the Contracting Officer.

7.2.3.2 Drilling into or through concrete sections by mechanical devices, to rectify casting errors or to accommodate any type of connection devices or hangers, shall not be allowed in sections less than 1-1/2 inch thick.

7.2.3.3 Where grout or concrete is used to embed connection devices between elements or to fill allowable casting tolerances, the requirements of ACI 318 shall be followed.

7.2.4 Assembly Tolerances:

7.2.4.1 All load-bearing surfaces at columns and wall panels shall be given a layer of cement grout prior to placing of the supported element to assure an even bearing over the entire contact surface.

7.2.4.2 Correction of minor misfits and/or casting errors which prevent proper assembly and fitting of elements shall be reported to the Contracting Officer so that he may either correct the error or approve the method of correction to be used. Elements shall not be forced or distorted to fit into position or alignment.

8. TOLERANCES:

8.1 Precast concrete elements to be to size and dimensions indicated on the drawings within the following limits at the time they are placed in the structure.

8.1.1 Overall Dimensions of Members:

+ 1/16 inch per 10 ft., but not to exceed to a total of + 1/8 inch or - 1/4 inch.

8.1.2 Cross-Sectional Dimensions:

Section less than 3 in. ---------- + 1/16"
Section over 3 in. and less than 18 in. -------- + 1/8"
Section over 18 in. ---------- + 1/4"

8.1.3 Deviation from Straight Line in Long Sections:

Not more than 1/4" per 20 ft. Diagonal dimensions not to vary more than 1-1/2".

8.1.4 Maximum differential between adjacent units in erected position - 1/4".

9. CLEANING:

9.1 After completion of pointing and caulking all precast work shall be thoroughly cleaned by scrubbing with brushes and a mild cleaner that contains no caustic or harsh fillers. Cleaning shall begin at the top of the building and proceed downward. Upon completion, leave precast facing clean and free from mortar stains or traces of cleaning compound.

10. CONSTRUCTION QUALITY CONTROL: Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

* * * * *

- REMINDER -

Located at the front of these specifications are the Contract Clauses, Special Clauses and Division I GENERAL REQUIREMENTS of the Technical Specifications, which apply to every aspect of this contract including the work in this section whether performed by Prime Contractor, subcontractor, or supplier.